Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Patent Application of:	)	
	)	
Braudaway	)	
	)	
Serial No.: 10/630,289	)	Art Unit: 2625
	)	
Filed: July 30, 2003	)	
	)	Examiner: McLean, Neil R.
For: Immediate Verification of Printed Copy	)	
	)	

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Commissioner for Patents
P.O. Box 1450
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APPEAL BRIEF
IN SUPPORT OF APPELLANTS' APPEAL
TO THE BOARD OF PATENT APPEALS AND INTERFERENCES

Sir:

Applicants (hereinafter "Appellants") hereby submit this Brief in support of its appeal from a final decision by the Examiner, mailed November 24, 2008, in the above-captioned case. Appellants respectfully request consideration of this appeal by the Board of Patent Appeals and Interferences (hereinafter "Board") for allowance of the above-captioned patent application.

An oral hearing is not desired.

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I. REAL PARTY IN INTEREST

The invention is assigned to InfoPrint Solutions, 6300 Diagonal Hwy., Boulder, CO 80301.

II. RELATED APPEALS AND INTERFERENCES

To the best of Appellants' knowledge, there are no appeals or interferences related to the present appeal that will directly affect, be directly affected by, or have a bearing on the Board's decision.

III. STATUS OF THE CLAIMS

No claims have been cancelled. No claims have been allowed. Claims 1-29 are currently pending in the above-referenced application. All pending claims were rejected in the Final Office Action, mailed November 24, 2008, and are the subject of this appeal.

IV. STATUS OF AMENDMENTS

In response to the Final Office Action, mailed November 24, 2008, rejecting claims 1-29, Appellants timely filed a Notice of Appeal on February 19, 2009.

A copy of all claims on appeal is attached hereto as Appendix of Claims.

V. SUMMARY OF THE INVENTION

Claim 1 discloses a system for detecting errors in a printed copy. The system includes one or more computer memories having one or more digitized source images **(See Figure 1a (blocks 161 and 165))**, one or more scanners that scan one or more printed copies to create one or more corresponding scanned images **(See Figure 1a (blocks 161 and 166))**, an alignment process that creates an initial replacement image from the scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images **(See Figure 1a (block 168) and Specification at Page 18, lines 17-20)**, the replacement scanned image being aligned with the digitized source image on a page by page, line by line, and pel by pel basis by using an affine transform to compute points of interest in the scanned image that correspond to each pel location in the digitized source image **(See Specification at Page 15, lines 14-20 and Page 23, lines 17-21)**, and a comparison process that compares one or more source pels of the digitized source image with one or more corresponding scanned pels of the initial replacement image to determine differences, the differences being defects in the printed copies **See Figure 1a (block 169) and Specification at Page 52, lines 13-23)**.

Claim 2 discloses a system for detecting errors in a printed copy. The system includes one or more computer memories having one or more digitized source images **(See Figure 1a (blocks 161 and 165))**, a digital printer that converts the digitized source images into one or more printed copies **(See Figure 1 (block 111))**, one or more scanners that scan the printed copies to create one or more corresponding scanned images **(See Figure 1a (blocks 161 and 166))**, an alignment process that creates an initial

replacement image from the scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images **(See Figure 1a (block 168) and Specification at Page 18, lines 17-20)**, the replacement scanned image being aligned with the digitized source image on a page by page, line by line, and pel by pel basis by using an affine transform to compute points of interest in the scanned image that correspond to each pel location in the digitized source image **(See Specification at Page 15, lines 14-20 and Page 23, lines 17-21)**, and a comparison process that compares one or more source pels of the digitized source image with one or more corresponding scanned pels of the initial replacement image to determine differences, the differences being defects in the printed copies **See Figure 1a (block 169) and Specification at Page 52, lines 13-23)**.

Claim 23 discloses a method for aligning content on a printed page. The method includes embedding two or more synchronization-strips into a digitized source image to form a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image, the synchronization-strips having a counter pattern at defined intervals to provide a unique page count (**See Specification at Page 16, line 1 – Page 18, 12)** and printing the marked source image to form a printed copy in the margins of a printed page, the embedded synchronization-strips containing line identification of one or more lines of the printed copy **(See Figure 8 (block 807) and Specification at Page 32, lines 8-17)**.

Claim 27 discloses a system for aligning content on a printed page. The system includes means for embedding two or more synchronization-strips into a digitized source image to produce a marked source image to locate lines in a first stream of the digitized

source image with a second stream of the digitized source image, the synchronization-strips having a counter pattern at defined intervals to provide a unique page count (**See Specification at Page 16, line 1 – Page 18, 12**) and means for printing the marked source image containing the synchronization-strips on a printed copy, the synchronization-strips containing line identification of one or more lines of the printed copy (**See Figure 8 (block 807) and Specification at Page 32, lines 8-17**).

Claim 28 discloses a system for aligning content in a printed copy. The system includes one or more scanners that scan one or more printed copies to create one or more corresponding digitized scanned images (**See Figure 1a (blocks 161 and 165)**), an alignment process that embeds two or more synchronization-strips into a digitized source image to produce a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image (**See Specification at Page 16, line 1 – Page 18, 12**); and printer that prints the marked source image with the embedded synchronization-strips in a sacrificial portion of a page to form the printed copy, the synchronization-strips containing line identification of one or more lines of the printed copy (**See Figure 8 (block 807) and Specification at Page 32, lines 8-17**).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claim 1 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Horiguchi et al., U.S. Patent No. 4,561,103 ("*Horiguchi*") in view of Szeliski et al., U.S. Patent No. 6,993,156 ("*Szeliski*") in further view of Davidson et al., U.S. Patent No. 6,952,485 ("*Davidson*").

Claims 2-29 stand rejected under U.S.C. §103(a) as being unpatentable over Hansen et al., U.S. Patent No. 7,013,803 ("*Hansen*") in view of *Davidson*.

VIII. ARGUMENTS

1. PENDING CLAIM 1 HAS BEEN IMPROPERLY REJECTED UNDER 35 U.S.C. § 103(A) BECAUSE A COMBIATION OF *HORIGUCHI*, *SZELISKI* AND *DAVIDSON* DOES NOT DISCLOSE OR SUGGEST EACH AND EVERY FEATURE OF THE PENDING CLAIMS

Appellant respectfully submits that the embodiments disclosed in *Horiguchi, Szeleski* and *Davidson* when combined fail to disclose or suggest the claimed invention for the reasons set forth below. As the Honorable Board is well aware, in order to establish a *prima facie* case of obviousness, the Office personnel must articulate the following:

> (1) a finding that the prior art included ***each element claimed***, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference;
>
> (2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely performs the same function as it does separately;
>
> (3) a finding that one of ordinary skill in the art would have recognized that the results of the combination were predictable; and
>
> (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (emphasis added)

Manual of Patent Examining Procedure (MPEP), 8th Edition, Revision 6, September 2007, §2143 (A).

(A) Claim 1 has been improperly rejected because the combination of *Horiguchi*, *Szeleski* and *Davidson* does not disclose or suggest an alignment process that creates an initial replacement image from the scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images.

The claims of the present application each recite an element that is not disclosed in either *Horiguchi, Szeleski* or *Davidson*. For example, Appellant's independent claim 1 recites the following:

> A system for detecting errors in a printed copy, the system comprising:
> one or more computer memories having one or more digitized source images;
> one or more scanners that scan one or more printed copies to create one or more corresponding scanned images;
> an alignment process that creates an initial replacement image from the scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images, the replacement scanned image being aligned with the digitized source image on a page by page, line by line, and pel by pel basis by using an affine transform to compute points of interest in the scanned image that correspond to each pel location in the digitized source image; and
> a comparison process that compares one or more source pels of the digitized source image with one or more corresponding scanned pels of the initial replacement image to determine differences, the differences being defects in the printed copies.

Horiguchi discloses a technique for inspecting picture patterns on prints which are being run in a rotary press, and more particularly to a method in which reference data read out of a reference print is written in a memory, and inspection data read out of a print under inspection is compared with the reference data for every picture element for instance to determine whether or not the print is acceptable, and an apparatus for practicing the method. The specific feature of the invention resides in that (1) in reading the above-described data a print running speed or the position of a picture pattern in the direction of width is detected to rewrite the reference data, (2) in data comparison, the

comparison level is optionally set up, and (3) the data comparison is carried out not only for every picture element, but also for the sum of picture elements over the entire picture pattern and for the sum of picture elements arranged linearly in the print running direction. See *Horiguchi* at Abstract.

Szeliski discloses using an affine transform. See *Szeliski* at col. 13, ll. 10-36.

Davidson discloses a streaming mode encoder that receives incoming, sequential bands of an image. It buffers these bands in a band FIFO that is at least one block in height. A block in the context of image watermark encoding refers to the size of image data into which a watermark encoder module embeds an entire watermark signal instance. The FIFO includes two separate buffers, enabling the embedder to load one with incoming data while performing embedding operations on image blocks in the other one. See *Davidson* at col. 5, ll. 42-51.

Appellant submits that *Horiguchi, Szeleski* and *Davidson* each fail to disclose or suggest a process of creating an initial replacement image from a scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images. The Examiner asserts that Davidson discloses this feature at col. 5, ll. 42-51. See Final Office Action at Page 9, ll. 4-11.

Applicant respectfully disagrees with the Examiner's assertion. The passage of Davidson relied on by the Examiner recites:

> FIG. 3 is a diagram of a streaming mode encoder. The streaming mode encoder receives incoming, sequential bands 300 of an image. It buffers these bands in a band FIFO 302 that is at least one block in height. A block in the context of image watermark encoding refers to the size of image data into which a watermark encoder module embeds an entire watermark signal

> instance. The FIFO includes two separate buffers, enabling the embedder to load one with incoming data while performing embedding operations on image blocks in the other one.

Davidson at col. 5, ll. 42-51.

The above-passage discloses an encoder that buffers bands of an image in a band FIFO and loading one buffer in the FIFO with incoming data while performing embedding operations on image blocks in the other FIFO. However, Appellant submits that in no way can a process of loading a first FIFO with incoming data while performing embedding operations on image blocks in a second FIFO be considered equivalent to ***creating an initial replacement image***, or ***generating additional lines in a scanned image to correspond to digitized source images***.

Since *Horiguchi, Szeleski* and *Davidson* each fail to disclose or suggest a process of creating an initial replacement image from a scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images, any combination of the references would necessarily fail to disclose or suggest such a process.

For the forgoing reasons, Appellant submits that the Examiner has failed to search and find a printed publication or patent that discloses the claimed invention as set forth in MPEP § 706.02(a).

Thus, the Examiner erred in rejecting claim 1 under 35 U.S.C. §103(a).

2. THE PENDING CLAIMS 2-29 AND WERE IMPROPERLY REJECTED UNDER 35 U.S.C. § 103(A) BECAUSE THE COMBINATION OF *HANSEN* AND *DAVIDSON* DOES NOT DISCLOSE OR SUGGEST EACH AND EVERY FEATURE OF THE PENDING CLAIMS

Appellant respectfully submits that the embodiments disclosed in *Hansen* and *Davidson* when combined fail to disclose or suggest the claimed invention for the reasons set forth below.

(A) Claims 2-22 were improperly rejected because the combination *of Hansen and Davidson does* not disclose or suggest an alignment process that creates an initial replacement image from the scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images.

The claims of the present application each recite an element that is not disclosed in either *Hansen* or *Davidson*. For example, Appellant's independent claim 2 recites the following:

> A system for detecting errors in a printed copy, the system comprising: one or more computer memories having one or more digitized source images;
> a digital printer that converts the digitized source images into one or more printed copies;
> one or more scanners that scan the printed copies to create one or more corresponding scanned images;
> an alignment process creates a replacement image from the scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images, the replacement image being aligned with the digitized source image on a page and page, line by line, and pel by pel basis; and
> a comparison process that compares one or more source pels of the digitized source image with one or more corresponding scanned pels of the

replacement image to determine differences, the differences being defects in the printed copies.

Hansen discloses a color registration control system for a printing press including an area scanner for acquiring an image of a paper substrate and an image processing system adapted to receive the image and process the image to determine any color register error. See *Hansen* at Abstract.

Appellant submits that neither *Hansen* nor *Davidson* disclose or suggest creating an initial replacement image from a scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images. As discussed above, *Davidson* fails to disclose or suggest such a process. Additionally, nowhere in *Hansen* is there disclosed or suggested the process of *creating an initial replacement image from a scanned image* ***by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images***.

Since neither *Hansen* nor *Davidson* disclose or suggest a process of creating an initial replacement image from a scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images, any combination of the references would necessarily fail to disclose or suggest such a process.

(B) Claims 23-29 were improperly rejected because the combination *of Hansen and Davidson does* not disclose or suggest embedding two or more synchronization-strips into a digitized source image to form a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image, wherein the synchronization-strips

have a counter pattern at defined intervals to provide a unique page count.

Appellant's independent claim 23 recites the following:

> A method for aligning content on a printed page, the method comprising the steps of:
> embedding two or more synchronization-strips into a digitized source image to form a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image, the synchronization-strips having a counter pattern at defined intervals to provide a unique page count; and
> printing the marked source image to form a printed copy in the margins of a printed page, the embedded synchronization-strips containing line identification of one or more lines of the printed copy.

Appellant's independent claim 27 recites:

> A system for aligning content on a printed page, the system comprising:
> means for embedding two or more synchronization-strips into a digitized source image to produce a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image, the synchronization-strips having a counter pattern at defined intervals to provide a unique page count; and
> means for printing the marked source image containing the synchronization-strips on a printed copy, the synchronization-strips containing line identification of one or more lines of the printed copy.

Appellant's independent claim 28 recites:

> A system for aligning content in a printed copy, the system comprising:

> one or more scanners that scan one or more printed copies to create one or more corresponding digitized scanned images;
>
> an alignment process that embeds two or more synchronization-strips into a digitized source image to produce a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image; and
>
> printer that prints the marked source image with the embedded synchronization-strips in a sacrificial portion of a page to form the printed copy, the synchronization-strips containing line identification of one or more lines of the printed copy.

Appellant submits that neither *Hansen* nor *Davidson* disclose or suggest embedding two or more synchronization-strips into a digitized source image to form a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image, wherein the synchronization strips have a counter pattern at defined intervals to provide a unique page count. However, the Examiner maintains that *Davidson* discloses this feature. See Final Office Action at Page 18, lines 4-13.

Davidson discloses a watermark encoder that can be used to embed tracer data in an image as it is being printed or transferred. The forensic tracer data may include: data identifying the date of an activity from a clock in the imaging device or host computer of the driver, data identifying the serial number of a computer system, data identifying a serial number of a system component, data identifying a user of the computer system, data identifying a file, data indicating the nature of a detected event, data indicating the status of the computer system, data from a registry database, data relating to an external network connection, and data derived from a digital watermark payload. See *Davidson* at

col. 9, ll. 45-56. Nevertheless, there is no disclosure in *Davidson* of ***synchronization-strips that have a counter pattern at defined intervals to provide a unique page count***.

Moreover, it would not be obvious to one of ordinary skill in the art to combine *Hansen* and *Davidson* and to disclose the present claims. Particularly, it would not be obvious to combine the color register mechanism with the watermark encoder since they are used to implement two separate functions. As discussed above, *Hansen* uses color register marks to measure color register, while *Davidson* uses watermarks to embed data in an image. Accordingly, one of ordinary skill in the art would not be motivated to combine the color register mechanism taught in *Hansen* with the watermarks of *Davidson*.

Claims 3-22, 24-26, and 29 depend from independent claims 2, 23 and 28, respectively. Given that dependent claims necessarily include the limitations of the claims from which they depend, Appellant submits that the invention as claimed in claims 50-61, 63-74, and 76-84 are similarly patentable over a combination of *Hansen* and *Davidson*.

For the forgoing reasons, Appellant submits that the Examiner has failed to search and find a printed publication or patent that discloses the claimed invention as set forth in MPEP § 706.02(a).

Thus, the Examiner erred in rejecting claims 2-29 under 35 U.S.C. §103(a).

IX. CONCLUSION

Appellants respectfully submit that all the appealed claims in this application are patentable and request that the Board of Patent Appeals and Interferences overrule the Examiner and direct allowance of the rejected claims.

Please charge any shortages and credit any overpayment to our Deposit Account No. 50-3669.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

Date: 5/29/09

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APPENDIX OF CLAIMS
(37 C.F.R. § 1.192(c)(9))

1. A system for detecting errors in a printed copy, the system comprising:

one or more computer memories having one or more digitized source images;

one or more scanners that scan one or more printed copies to create one or more corresponding scanned images;

an alignment process that creates an initial replacement image from the scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images, the replacement scanned image being aligned with the digitized source image on a page by page, line by line, and pel by pel basis by using an affine transform to compute points of interest in the scanned image that correspond to each pel location in the digitized source image; and

a comparison process that compares one or more source pels of the digitized source image with one or more corresponding scanned pels of the initial replacement image to determine differences, the differences being defects in the printed copies.

2. A system for detecting errors in a printed copy, the system comprising: one or more computer memories having one or more digitized source images;

a digital printer that converts the digitized source images into one or more printed copies;

one or more scanners that scan the printed copies to create one or more corresponding scanned images;

an alignment process creates a replacement image from the scanned image by performing an interpolation to generate additional lines in the scanned images to correspond to the digitized source images, the replacement image being aligned with the digitized source image on a page and page, line by line, and pel by pel basis; and

a comparison process that compares one or more source pels of the digitized source image with one or more corresponding scanned pels of the replacement image to determine differences, the differences being defects in the printed copies.

3. A system, as in claim 2, where the alignment process comprises a course-alignment and a subsequent fine alignment.

4. A system, as in claim 3, where the course alignment produces an initial replacement image and the fine alignment produces a final replacement image being the replacement image.

5. A system, as in claim 3, where the course alignment is a repeated application of an affine transform of source image pels and the fine alignment is a repeated application of a one dimensional cross-correlation of one or more course aligned pels to source pels.

6. A system, as in claim 2, where the alignment process comprises the steps of:

embedding two or more vertical synchronization-strips into the digitized source image;

printing the synchronization-strips on the printed copy;

scanning the printed copy so that two or more scanned vertical synchronization-strips are embedded in the scan copy, the vertical synchronization-strips being separated by a first separation distance;

tracking the horizontal and vertical coordinates of one or more sequential and specifically identifiable features in lines of the synchronization-strip to create a line by line correspondence between the source image and the corresponding scanned image;

performing a scanned image pixel value interpolation based on an affine transform, comprising the following steps:

sub dividing the source image and scanned image into one or more source and scanned horizontal strips, respectively;

determining at least two corresponding points on two corresponding lines in the source and scanned images, the two corresponding lines separated by a second separation distance;

using at least four of the corresponding points, two at a time from each of the lines to develop a transformation of the coordinates of pels in the source image to points of interest in the scanned image; determining an interpolated pixel value of the scanned image at the point of interest; and

for each pixel, placing the interpolated pixel value into an initial replacement image at the pel coordinates corresponding to the pel of the source image used to determine the point of interest.

7. A system, as in claim 6, where the alignment process further comprises the steps of:

dividing the source image into a plurality of initial source horizontal strips;

dividing one of the source horizontal strips into a plurality of source vertical stripes;

dividing the initial aligned image into a plurality of initial aligned horizontal strips; dividing one of the aligned horizontal strips into a plurality of initial vertical stripes;

dividing the initial horizontal strip corresponding to the respective source horizontal strips into a plurality of initial vertical stripes, the source vertical stripes and the initial vertical strips corresponding to one another and having the same height and width;

determining three or more cross-correlation values between the source and initial vertical stripes for an initial horizontal alignment and two or more horizontal offsets between the source and initial vertical stripes;

using the three or more cross-correlation values and their corresponding offsets to further determine an interpolated offset that produce the optimal correlation value;

producing an interpolated offset for each pair of source and initial vertical stripes;

performing a piece-wise interpolation between the interpolated offsets to develop a fine alignment that is dependent on the horizontal pel position of the source image; and

re-performing the scanned image pixel value interpolation wherein a horizontal coordinate of the pel of the source image is increased by the piece-wise interpolated value of the fine alignment.

8. A system, as in claim 2, where the comparison process uses masks.

9. A system, as in claim 8, where the mask is a dilation mask.

10. A system, as in claim 8, where the mask is an erosion mask.

11. A system, as in claim 2, where the comparison process comprises the steps of:

dilating the source image;

eroding the replacement image;

bit-wise or'ing the corresponding one-bit pel values of the dilated source image and the eroded replacement image to produce a first intermediate result;

bit-wise exclusive-or'ing the first intermediate result with the one-bit pel values of the dilated source image to indicate the pel locations of excess ink in the scanned image.

12. A system, as in claim 11, where the comparison process further comprises the step of: declaring a defect only if two or more adjacent pel locations have an excess of ink.

13. A system, as in claim 12, where the defect is declared in at least one of the following situations: two or more horizontally adjacent pel locations have an excess of ink, two or more vertical adjacent pel locations have an excess of ink, and two or more horizontally adjacent and two or more vertical adjacent pel locations have an excess of ink.

14. A system, as in claim 2, where the comparison process comprises the steps of:

dilating the replacement image;

eroding the source image;

bit-wise and'ing the corresponding one-bit pel values of the dilated replacement image and the eroded source image to produce a second intermediate result;

bit-wise exclusive-or'ing the second intermediate result with the one-bit pel values of the eroded source image to indicate the pel locations of missing ink in the scanned image.

15. A system, as in claim 14, where the comparison process further comprises the step of: declaring a defect only if two or more adjacent pel locations are missing ink.

16. A system, as in claim 14, where the defect is declared in at least one of the following situations: two or more horizontally adjacent pel locations are missing ink, two or more vertical adjacent pel locations are missing ink, and two or more horizontally adjacent and two or more vertical adjacent pel locations are missing ink.

17. A system, as in claim 2, where the comparison process comprises the steps of:

thresholding and dilating the source image;

thresholding and eroding the replacement image;

bit-wise or'ing the corresponding pel values of the dilated source image and the eroded replacement image to produce a first intermediate result;

bit-wise exclusive-or'ing the first intermediate result with the dilated source image to indicate the pel locations of excess ink and stray marks in the scanned image.

18. A system, as in claim 17, where the threshold is any one of the following percentage of the initial pixel values: 5% -95%, 25%, and 50%.

19. A system, as in claim 2, where the comparison process comprises the steps of:

thresholding and dilating the replacement image;

thresholding and eroding the source image;

bit-wise and'ing the corresponding pel values of the dilated replacement image and the eroded source image to produce a second intermediate result;

bit-wise exclusive-or'ing the second intermediate result with the eroded source image to indicate the pel locations of missing ink in the scanned image.

20. A system, as in claim 19, where the threshold is any one of the following percentage of the initial pixel values: 5%-95%, 25%, and 50%.

21. A system, as in claim 2, where the scanner has a line array sensor.

22. A system, as in claim 21, where the line array sensor is compensated so that all pixels that sense only black ink printed on paper produce the same black numeric value and that all pixels that sense blank paper produce the same white numeric value.

23. A method for aligning content on a printed page, the method comprising the steps of:

embedding two or more synchronization-strips into a digitized source image to form a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image, the synchronization-strips having a counter pattern at defined intervals to provide a unique page count; and

printing the marked source image to form a printed copy in the margins of a printed page, the embedded synchronization-strips containing line identification of one or more lines of the printed copy.

24. A method, as in claim 23, further comprising the steps of:

scanning the printed copy so that two or more scanned vertical synchronization-strips are embedded in a scanned image, the vertical synchronization-strips being separated by a first separation distance; and

tracking the horizontal and vertical coordinates of one or more sequential and specifically identifiable features in the synchronization-strip to create a line by line correspondence between the marked source image and the corresponding scanned image.

25. A method, as in claim 24, further comprising the steps of:

performing a scanned image pixel value interpolation based on an affine transform, the affine transform comprising the following steps:

sub dividing the source image and scanned image into one or more source and scanned horizontal strips, respectively;

determining by synchronization-strip tracking at least two corresponding points on two corresponding lines in the source and scanned images, the two corresponding lines separated by a second separation distance;

using at least four of the corresponding points, two at a time from each of the lines to develop a transformation of the coordinates of pels in the source image to points of interest in the scanned image;

determining an interpolated pixel value of the scanned image at the point of interest; and for each pixel, placing the interpolated pixel value into an initial replacement image at the pel coordinates corresponding to the pel of the source image used to determine the point of interest.

26. A system, as in claim 23, where the alignment process further comprises the steps of:

dividing the source image into a plurality of initial source horizontal strips;

dividing one of the source horizontal strips into a plurality of source vertical stripes; dividing the initial aligned image into a plurality of initial aligned horizontal strips;

dividing one of the aligned horizontal strips into a plurality of initial vertical stripes;

dividing the initial horizontal strip corresponding to the respective source horizontal strips into a plurality of initial vertical stripes, the source vertical stripes and

the initial vertical strips corresponding to one another and having the same height and width;

determining three or more cross-correlation values between the source and initial vertical stripes for an initial horizontal alignment and two or more horizontal offsets between the source and initial vertical stripes;

using the three or more cross-correlation values and their corresponding offsets to further determine an interpolated offset that produce the optimal correlation value; producing an interpolated offset for each pair of source and initial vertical stripes;

performing a piece-wise interpolation between the interpolated offsets to develop a fine alignment that is dependent on the horizontal pel position of the source image; and

re-performing the scanned image pixel value interpolation wherein a horizontal coordinate of the pel of the source image is increased by the piece-wise interpolated value of the fine alignment.

27. A system for aligning content on a printed page, the system comprising:

means for embedding two or more synchronization-strips into a digitized source image to produce a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image, the synchronization-strips having a counter pattern at defined intervals to provide a unique page count; and

means for printing the marked source image containing the synchronization-strips on a printed copy, the synchronization-strips containing line identification of one or more lines of the printed copy.

28. A system for aligning content in a printed copy, the system comprising:

one or more scanners that scan one or more printed copies to create one or more corresponding digitized scanned images;

an alignment process that embeds two or more synchronization-strips into a digitized source image to produce a marked source image to locate lines in a first stream of the digitized source image with a second stream of the digitized source image; and

printer that prints the marked source image with the embedded synchronization-strips in a sacrificial portion of a page to form the printed copy, the synchronization-strips containing line identification of one or more lines of the printed copy.

29. A system, as in claim 28, wherein the sacrificial portion of a page includes any one or more of the following locations: in a vertical gutter between pages printed on a web segment and in a vertical sacrificial part of the web segment.

XI. EVIDENCE APPENDIX

None

XII. RELATED PROCEEDING APPENDIX

None